The Impact of Altimeter Range Observations on NEAR Navigation

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The Near Earth Asteroid Rendezvous (NEAR) spacecraft is currently in the early part of the orbit phase around the asteroid Eros. Altimeter range measurements from the LIDAR instrument aboard NEAR are processed in combination with the primary tracking data types, including Deep Space Network (DSN) tracking and optical landmark tracking. As a backup observation type, the LIDAR measurements are not used to generate the operational orbits. Analysis of the impact of the altimeter observations on the estimation of the Eros shape model and the NEAR orbits is performed. The analysis includes an assessment of the impact of altimeter observations on solution convergence when different a priori shape models are used and when different combinations of tracking data are used. The effectiveness of using the LIDAR observations to estimate the shape model while holding the orbits fixed is examined, and similarly the effect of estimating the orbits while holding the shape model fixed is examined.